

Integrated Lights-Out 3 Virtual Serial Port configuration and operation

HOWTO, 6th Edition

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Introduction

HP Integrated Lights-Out 3 (iLO 3) consists of an intelligent processor and firmware that lets you manage servers remotely. The iLO Virtual Serial Port (VSP) is one iLO method of accessing a remote server. The VSP gives you a bi-directional data flow with a server serial port. Using the remote console, you can operate as if a physical serial connection exists on the remote server serial port.

This HOWTO describes VSP configuration and operation. You should be familiar with Lights-Out technology before reading this document.

NOTE

Unless otherwise specified, all references to iLO in this document refer to iLO 3.

Conceptual overview

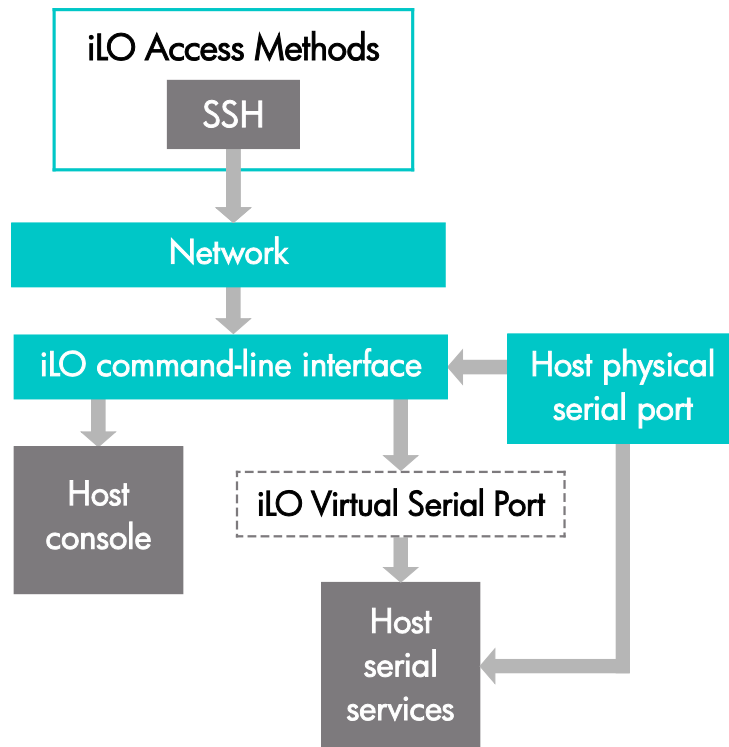
iLO VSP technology is a component of iLO remote management. In iLO, you access the VSP functions through the command-line interface. VSP was renamed Remote Serial Console in iLO 2; however, it functions the same as before, including the text-based console. Table 1 briefly describes elements of iLO VSP technology.

Table 1. Elements of iLO VSP technology

Element	Description
Access method	Using the Secure Shell (SSH), you can access iLO through a command-line interface (CLI) over the network.
Management interfaces	There are two remote management interfaces: the iLO browser interface and the iLO CLI.
Command-line interface	You can access the text-based Host Console and the iLO VSP through iLO CLI.
Virtual serial port (VSP)	The iLO VSP can remotely access the following host serial services: <ul style="list-style-type: none">• Microsoft® Windows® Server 2003 and 2008 Operating System Emergency Management Services (EMS) Console• Linux® user session through serial tty (ttyS0 or ttyS1)• System POST dialog
Host physical serial port	You can access the following host serial services through the iLO CLI: <ul style="list-style-type: none">• Microsoft® Windows® Server 2003 and 2008 Operating System Emergency Management Services (EMS) Console• Linux user session through serial tty (ttyS0 or ttyS1)• System POST dialog

Figure 1 shows the relationship of the elements of iLO VSP. It also shows how the two iLO interfaces work through their different access methods to enable the iLO VSP.

Figure 1. Diagram of iLO VSP interfaces



Security

iLO uses 128-bit SSL and SSH frameworks to ensure privacy of iLO actions, depending on the access modes and types of functions being performed. Within these frameworks, iLO supports RC4, 3DES, and AES ciphers. Key exchange uses RSA/Diffie-Hellman, and keys rotate every 3 minutes. Certificates are generated using 1024-bit RSA keys signed with MD5RSA and using a SHA1 fingerprint.

Configuration

You must enable and configure the VSP in several places:

- Host system RBSU
- Windows Server 2003 and Windows Server 2008 operating systems
- Linux operating system

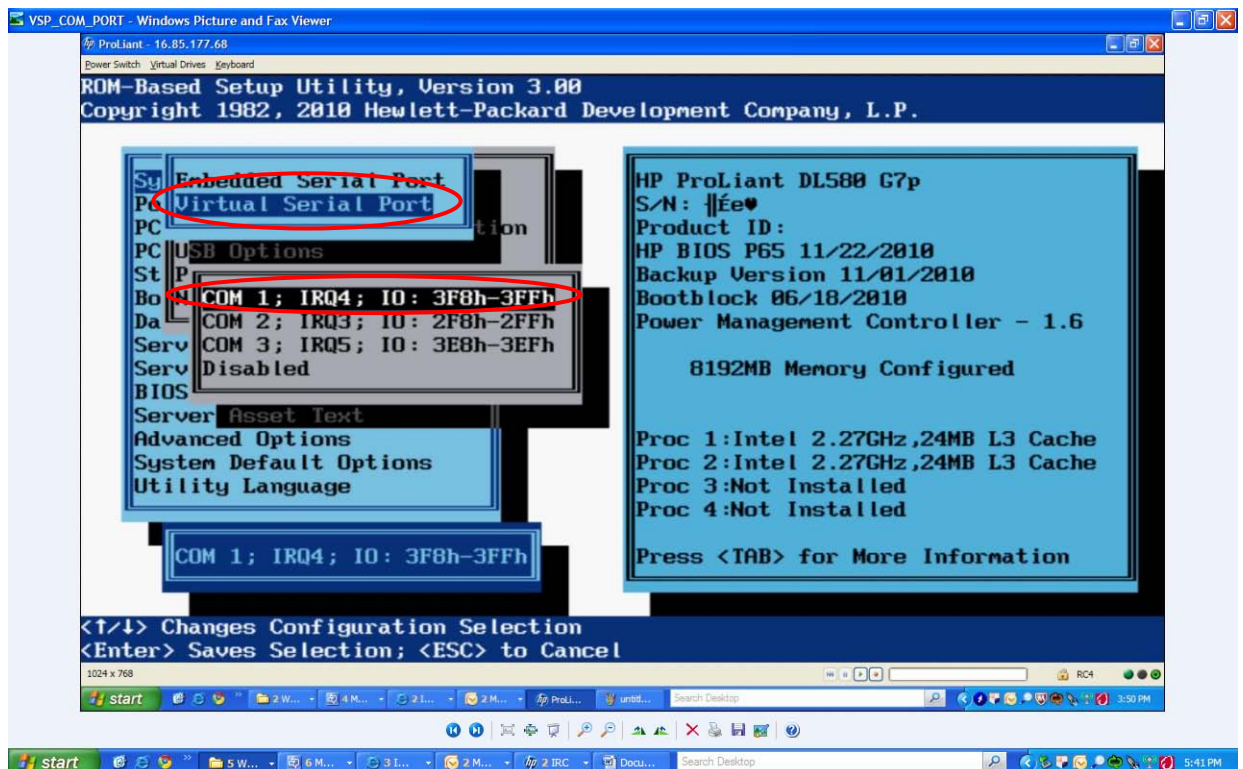
Configuring VSP in the host system RBSU

You must configure some parameters in the ROM Based Setup Utility (RBSU) before you enable VSP. The following steps apply to both Windows and Linux.

HP ProLiant server models with standard Universal Asynchronous Receiver/Transmitter (UART) mode

1. Start RBSU.
2. Highlight the **System Options** option in RBSU, and then press the **Enter** key.
3. Highlight the **Virtual Serial Port** option (Figure 2), and then press the **Enter** key.
4. Select the COM port you want to use, and then press the **Enter** key.

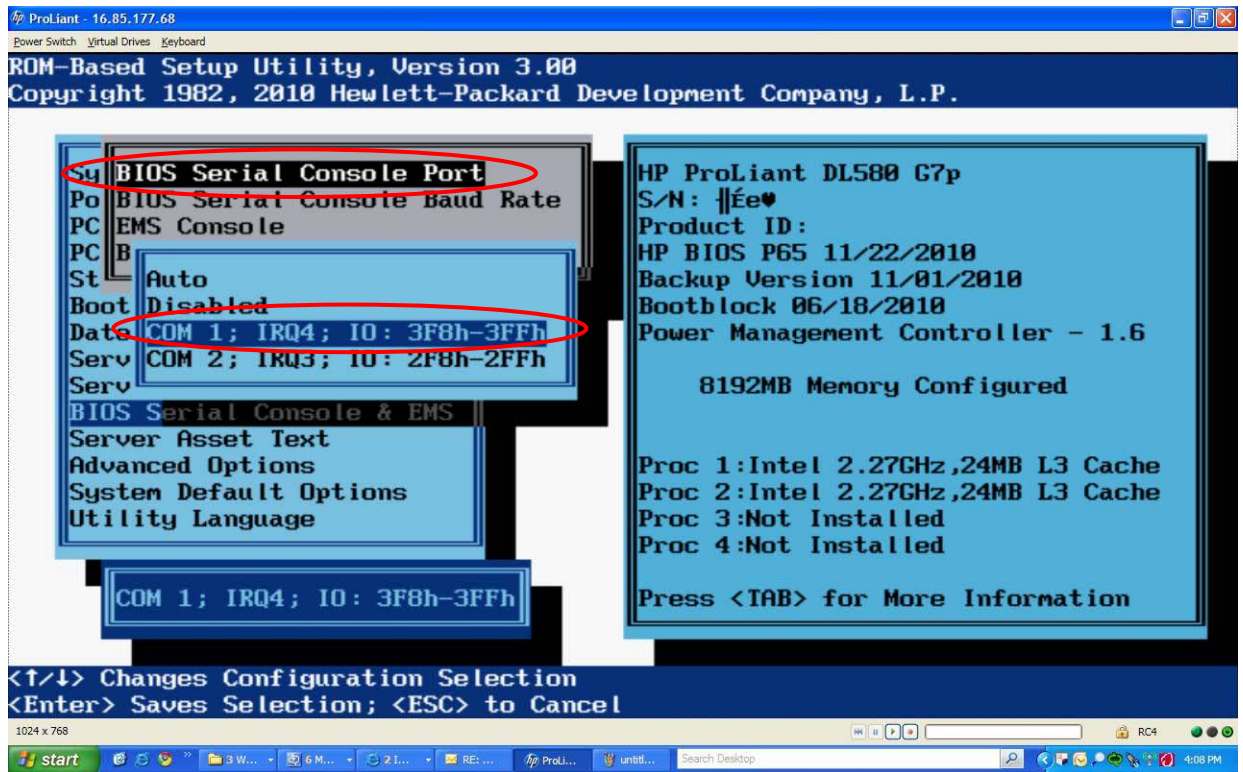
Figure 2. Selecting the Virtual Serial Port option



5. Highlight the **BIOS Serial Console & EMS** option, and then press the **Enter** key.
Note: EMS is for Windows. It is not use for Linux.

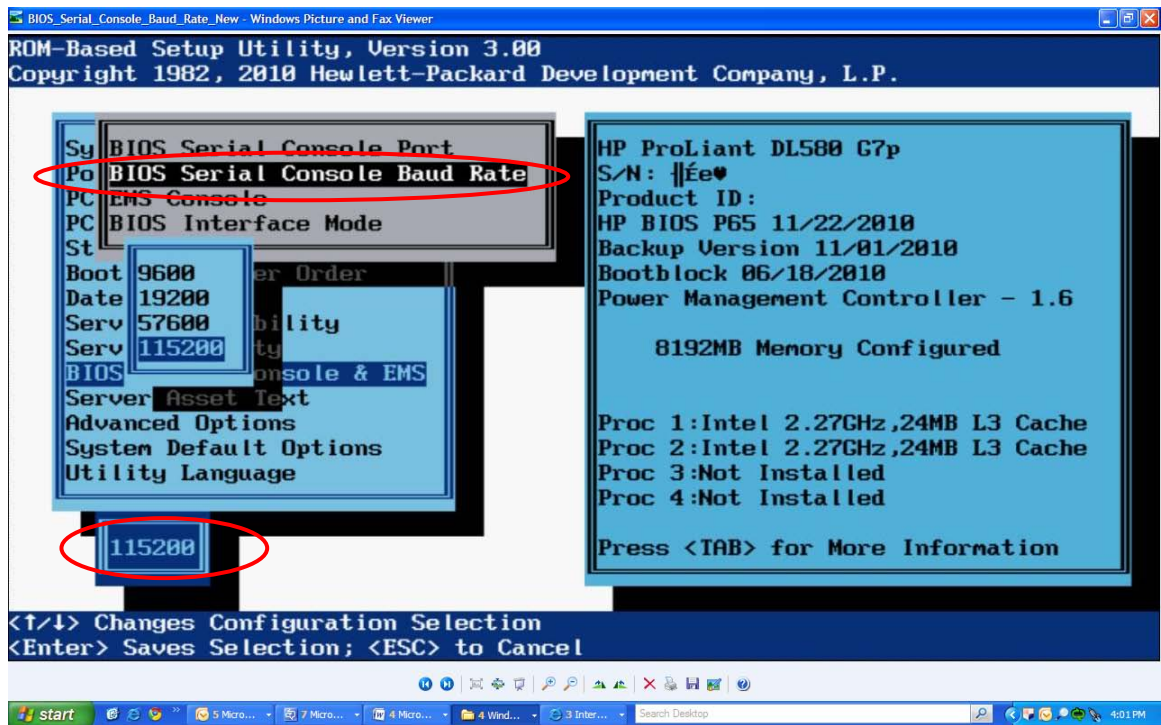
6. Highlight the **BIOS Serial Console Port** option (Figure 3), and then press the **Enter** key.
7. Select the COM port that matches the Virtual Serial Port value selected earlier, and then press the **Enter** key.

Figure 3. Selecting the BIOS Serial Console Port and COM port



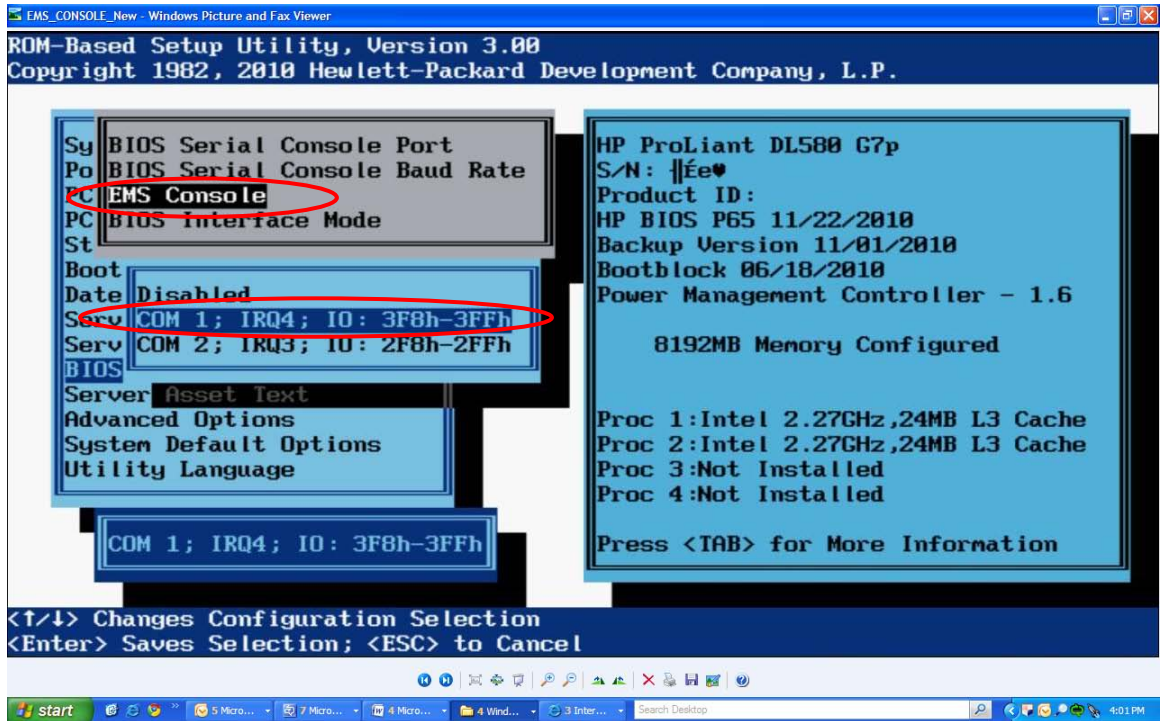
8. Highlight the **BIOS Serial Console Baud Rate** option (Figure 4), and then press the **Enter** key.
9. Select the **115200** BIOS Serial Baud Rate.

Figure 4. Selecting the BIOS Serial Baud Rate



10. Highlight the **EMS Console** option (Figure 5), and then press the **Enter** key.
11. Select the COM port that matches the Virtual Serial Port value selected earlier, and then press the **Enter** key.

Figure 5. Selecting the EMS Console option



Configuration for Windows Server 2003 and 2008 operating systems

The Windows EMS Console is available in the Windows Server 2003 and 2008 operating systems. You must configure the EMS console within the operating system before you can use VSP. Refer to your operating system documentation for information about how to enable the EMS console. iLO displays an error message when you open VSP through the Internet browser, if you have not enabled the EMS console.

Configuration for Linux operating systems

You can manage Linux servers remotely using console redirection. To configure Linux to use console redirection, you must implement the following changes in the Linux boot loader (GRUB):

- Turn off the splash image.
- Configure the GRUB to redirect messages to the serial port to display messages while Linux starts.
- Configure the GRUB to enable the Linux kernel to redirect messages to the serial port to display Linux console messages.

Sample GRUB configuration file for Red Hat Linux:

```
default=0
timeout=10
splashimage=(hd0,2)/grub/splash.xpm.gz
title Red Hat Enterprise Linux Server(2.6.18-164.e15)
    root (hd0,2)
    kernel /vmlinuz-2.6.18-164.e15 ro root=/dev/VolGroup00/LogVol100 rhgb quiet
    initrd /initrd-2.6.18-164.e15.img
```

Turn off the splash image

Since the VSP is non-graphical, you must turn off the splash image. To do that, comment out that line by inserting the pound (#) character at the beginning of the line, as follows:

```
default=0
timeout=10
#splashimage=(hd0,2)/grub/splash.xpm.gz
title Red Hat Linux (2.6.18-164.e15)
    root (hd0,2)
    kernel /vmlinuz-2.6.18-164.e15 ro root=/dev/VolGroup00/LogVol100 rhgb quiet
    initrd /initrd-2.6,18-164,e15.img
```

Configure the GRUB to redirect messages to the serial port

Define the serial interface (ttyS0) as the default interface so that if no input arrives from the local keyboard within 10 seconds (the default timeout value), the system will redirect output to the serial interface (VSP). You must insert the serial command as shown below to define the serial interface as the default interface:

```
serial -unit=0 -speed=115200
terminal -timeout=10 serial console
default=0
timeout=10
#splashimage=(hd0,2)/grub/splash.xpm.gz
title Red Hat Linux (2. 6.18-164.e15)
    root (hd0,2)
```



```
kernel /vmlinuz-2. 6.18-164.el5 ro root=/dev/sda9 console=tty0, 115200,  
initrd /initrd-2. 6.18-164.el5.img
```

Redirect the login console to the serial port

After Linux is fully booted, you can redirect a login console to the serial port. If you configure the `/dev/ttyS0` and `/dev/ttyS1` devices, you can obtain serial tty sessions through the VSP console. Here are the general configuration guidelines for Linux systems:

1. To begin a shell session on a configured serial port, you can start the Linux process from the system administrator shell, but it is usually configured in the `/etc/inittab` to start automatically during system boot:

```
sx:2345:respawn:/sbin/agetty 115200 ttySx vt100
```

2. Paste the following into `/etc/init/ttyS0.conf` for `com1`.

```
# ttyS0 - getty  
#  
# This service maintains a getty on ttyS0 from the point the system is  
# started until it is shut down again.  
  
start on stopped rc RUNLEVEL=[2345]  
stop on runlevel [!2345]  
  
respawn  
exec /sbin/agetty -L 115200 ttyS0 vt102
```

NOTE

RHEL6 is moving to the newer upstart init daemon, which replaces the older inittab style daemon. You now configure the serial port in the `/etc/init/ttyxx.conf` files. Refer to RHEL6 documentation for the details of the new configuration method for serial ports.

3. Linux requires listing the terminal in the `/etc/security` file to logon as root. Depending on the server model, add one of the following lines at the end of this file: `ttyS0` or `ttyS1`.
4. You must reboot the server before Linux will recognize the changes made in these files.

NOTE

You can find a sample Perl script (`vspconfig.pl`) that automatically performs changes to the `/etc/inittab` file and the `/etc/security` file. It is in the RIBCL sample scripts package located here:
<http://h20000.www2.hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?lang=en&cc=us&prodTypeId=18964&prodSeriesId=1146658&prodNameId=1135772&swEnvOID=2025&swLang=8&mode=2&taskId=135&swItem=MTX-3b426a21bf8d40df88f91ea960>.

Linux SysRq command support

iLO firmware version 1.1x supports Linux SysRq commands using the VSP. For this feature to work, you must do one of the following on the Linux server:

- `echo 1 > /proc/sys/kernel/sysrq`
- edit the `/etc/sysctl.conf` to insert `"kernel.sysrq = 1"`

Operation

Virtual Serial Port operation depends upon the application you are using.

Windows Emergency Management Services (EMS) Console

If enabled, the Windows EMS Console allows emergency management services in cases where video, device drivers, or other operating system features have prevented normal operation and normal corrective actions. The EMS Console lets you display running processes, change the priority of processes, and halt processes. The EMS Console is available in the Windows Server 2003 and 2008 operating systems through the physical serial port on the back of the server.

The iLO VSP lets you use the EMS Console over the network. You can use The EMS Console and the iLO Remote Console at the same time. You must enable the Windows EMS serial port through the host system RBSU.

After you connect to the EMS through the VSP, the EMS System Administration Console (SAC) opens, and the SAC> prompt displays. You may need to press the **Enter** key to get the prompt. At the prompt, several commands are available. Refer to Microsoft EMS documentation for a complete description of the available commands.

Windows Server 2003 and 2008 EMS commands

Consult Microsoft documentation for full details of EMS operation. This section presents a command overview only.

After you enter each command at the EMS SAC prompt, press the **Enter** key to execute the command. Table 2 lists the EMS SAC commands.

Table 2. EMS SAC commands

Command	Description
Help or ?	Lists all commands available in the VSP console
Ch	Lists all channels: <ul style="list-style-type: none"> ch -si <#> = Switch to a channel by its number. ch -sn <name> = Switch to a channel by its name. ch -ci <#> = Close a channel by its number. ch -cn <name> = Close a channel by its name.
Esc + Tab	Selects a channel
Esc + Tab + 0 (zero)	Returns to the EMS SAC channel.
Cmd	Creates a command prompt channel
D	Dumps the current kernel log
F	Toggles detailed or abbreviated task list information.
I	Lists all Internet Protocol (IP) network numbers and their IP addresses
i <#> <ip> <subnet> <gateway>	Sets IP address, subnet, and gateway
Id	Displays the identification information on the server: <ul style="list-style-type: none"> computer name computer GUID processor architecture version number build number product operating system applied service pack time since last reboot
k <pid>	Stops the given process as defined by <pid>
l <pid>	Lowers the priority of the process as defined by <pid> to the lowest possible priority
Lock	Locks access to command prompt channels
m <pid> <MB-allow>	Limits the memory usage of a process to <MB-allow>
P	Toggles paging the display
r <pid>	Raises by one the priority of a process as defined by <pid>
S	Displays the current time and date in 24-hour clock notation
s mm/dd/yyyy hh:mm	Sets the current time and date in 24-hour clock notation
T	Displays the current operating system task list
Restart	Restarts the system immediately
Shutdown	Shuts down the system immediately
Crashdump	Crashes the system (crash dump must be enabled)

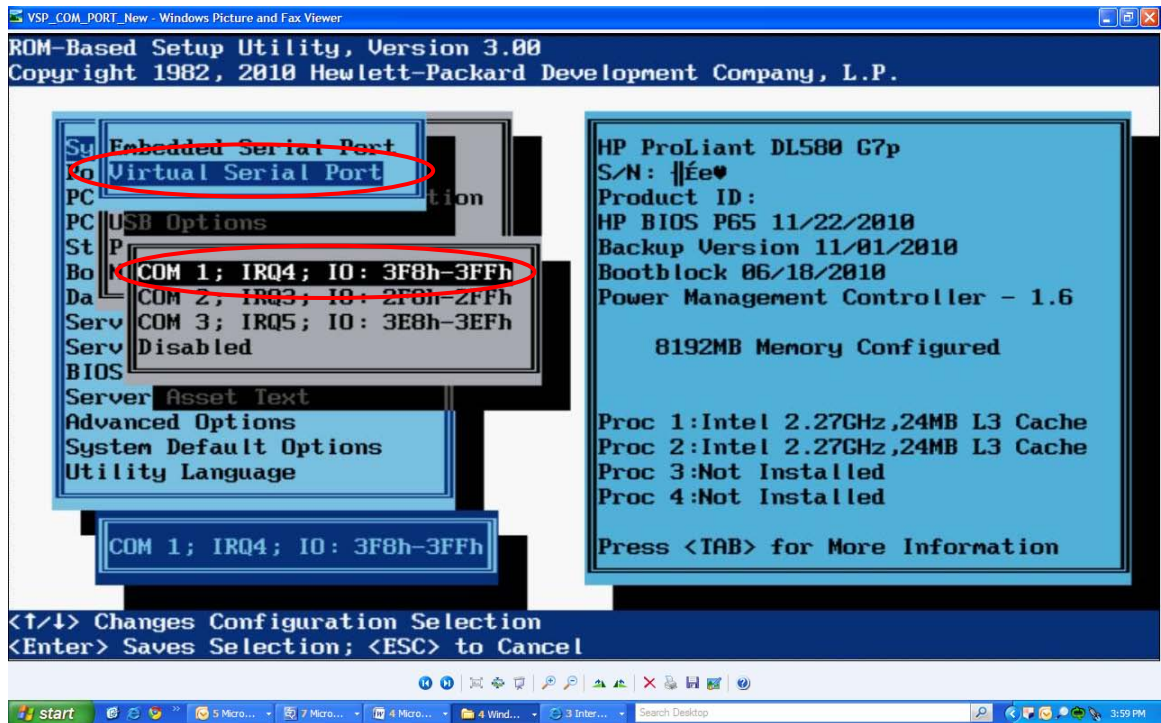
BIOS serial console redirection (for Windows and Linux)

If you configured the server to use BIOS serial console redirection, the system presents POST messages through the VSP during system boot. To enable this feature, go to the tab called **BIOS Serial Console/EMS Support** in RBSU. Select this tab and set **BIOS Serial Console Port** to **COM1**:

Enabling serial console redirection

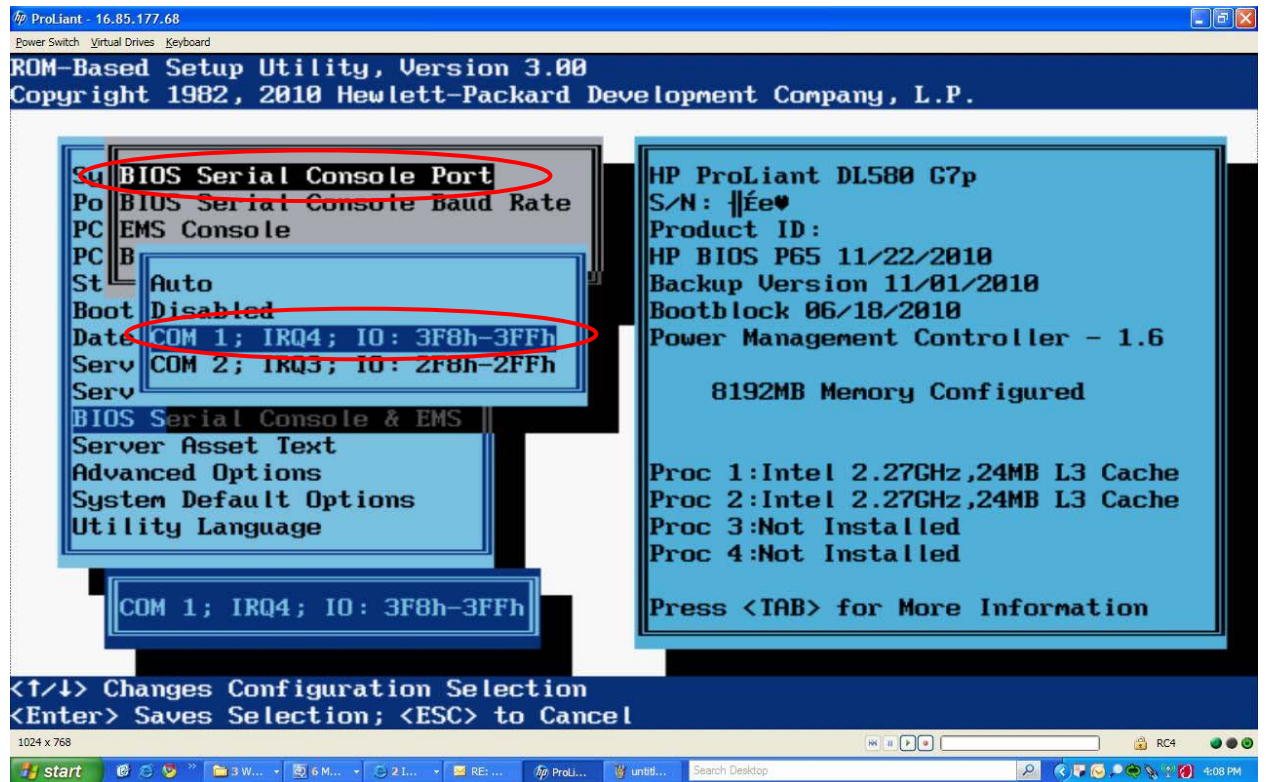
1. Start RBSU.
2. Highlight the **System Options** option in RBSU, and then press the **Enter** key.
3. Highlight the **Virtual Serial Port** option (Figure 6), and then press the **Enter** key.
4. Select the COM port you want to use, and then press the **Enter** key.

Figure 6. Setting the Virtual Serial Port



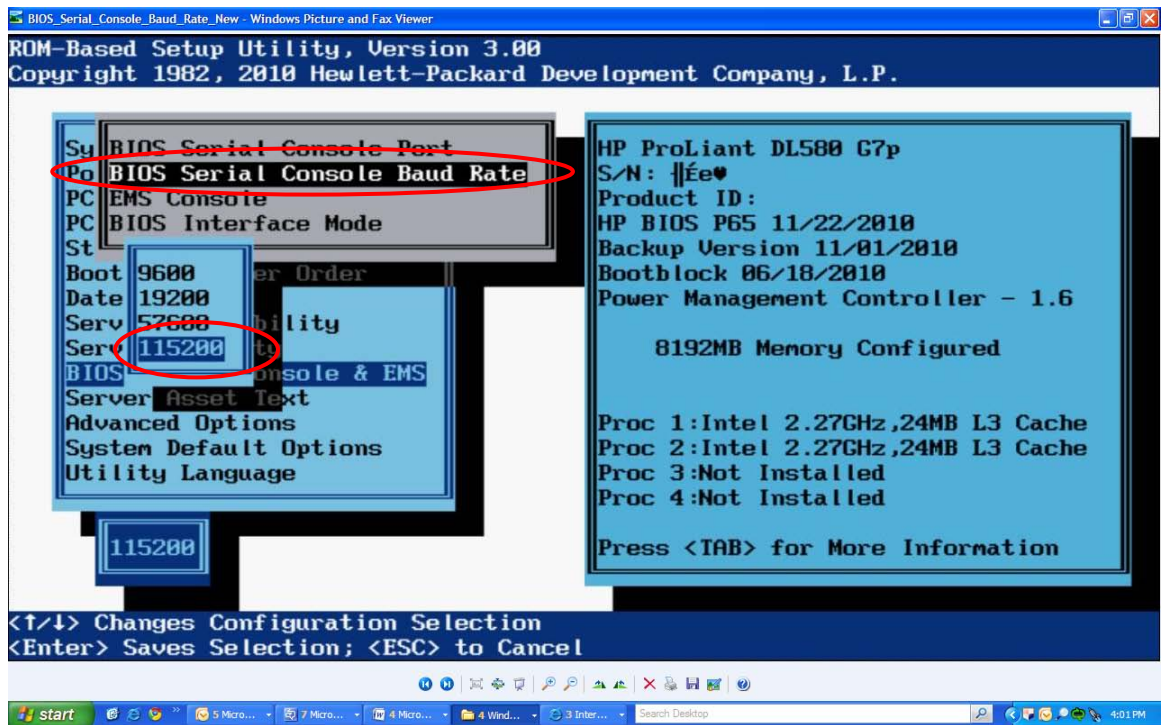
5. Highlight the **BIOS Serial Console & EMS** option, and then press the **Enter** key.
6. Highlight the **BIOS Serial Console Port** option (Figure 7), and then press the **Enter** key.
7. Select the COM port that matches the Virtual Serial Port value selected earlier, and then press the **Enter** key.

Figure 7. Setting the BIOS Serial Console Port



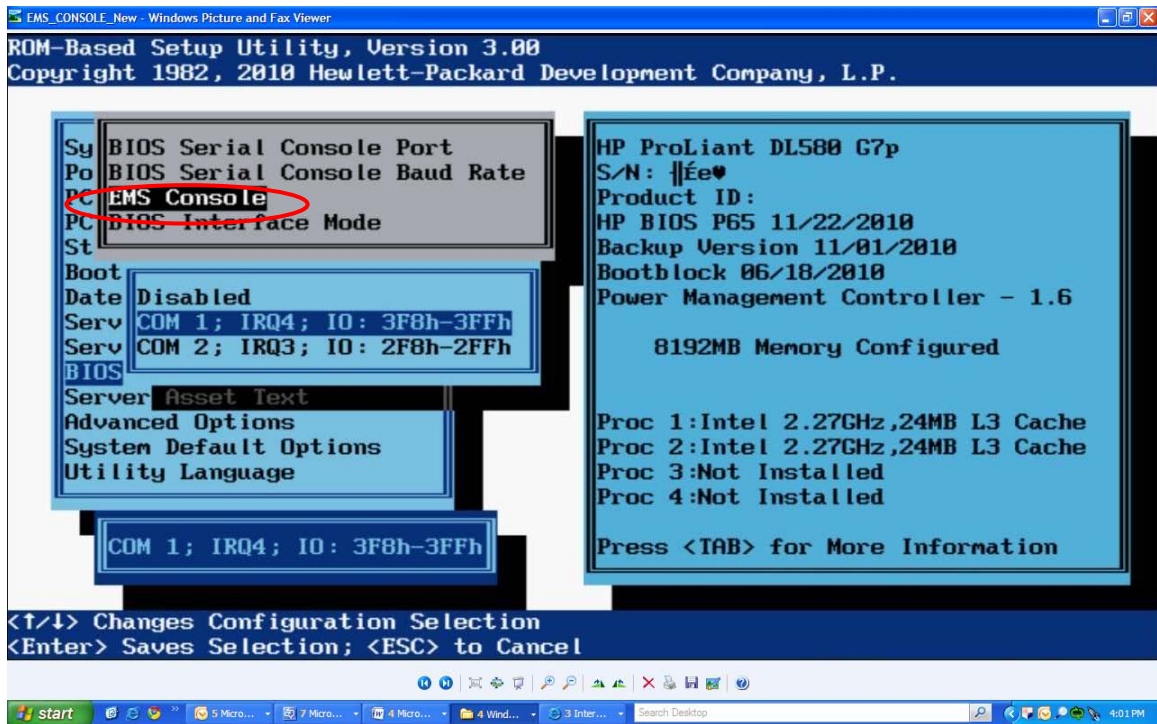
8. Highlight the **BIOS Serial Console Baud Rate** option (Figure 8), and then press the **Enter** key.
9. Select the **115200** BIOS Serial Baud Rate.

Figure 8. Setting the BIOS Serial Console Baud Rate



10. Highlight the **EMS Console** option (Figure 9), and then press the **Enter** key.
11. Select the COM port that matches the Virtual Serial Port value selected earlier, and then press the **Enter** key.

Figure 9. Setting the EMS Console



How to use VSP from a Secure Shell client

You must use an SSH client to provide secure, non-browser access to the VSP. Make sure you set the connection type to be a secure shell. You can use various SSH clients to connect to iLO. Specific instructions for their use are application dependent.

How to enter VSP from the command line protocol (CLP)

After you log into iLO through an SSH session, iLO displays the CLP prompt. Use the CLP to enter VSP (see Figure 10).

Figure 10. Entering VSP from the CLP

```
</>hpiLO-> ?

status=0
status_tag=COMMAND COMPLETED

DMTF SMASH CLP Commands:

help      : Used to get context sensitive help.
show      : Used to show values of a property or contents of a collection target.
create    : Used to create new instances in the name space of the MAP.
delete    : Used to destroy instances in the name space of the MAP.
load      : Used to move a binary image from an URI to the MAP
Example   : load -source http://188.188.188.55/images/fw/iLO170.bin
reset     : Used to cause a target to cycle from enabled to disabled and back to
           : enabled.
set       : Used to set a property or set of properties to a specific value.
start     : Used to cause a target to change state to a higher run level.
stop      : Used to cause a target to change state to a lower run level.
cd        : Used to set the current default target.
exit      : Used to terminate the CLP session.
version   : Used to query the version of the CLP implementation or other CLP
           : elements.

HP CLI Commands:

POWER     : Control server power.
UID       : Control Unit-ID light.
NMI       : Generate an NMI.
VM        : Virtual media commands.
REMCONS   : Invoke remote console.
VSP       : Invoke virtual serial port.

</>hpiLO-> start /system1/oemhp_vsp1
```

NOTE

You can use CLI commands to start the VSP, but CLP commands are preferred.

Command line interface key sequences for iLO

Table 3 lists key sequences for initiating certain iLO actions.

Table 3. iLO key sequence commands

Key sequence	Description
<ESC>(Invokes the iLO command line interface
<ESC>Q	Exits the iLO command line interface
<ESC>R<ESC>r<ESC>R	Resets the server
<ESC>^	Powers on the server

Command line interface keymap for iLO

If your terminal program supports custom key maps, you can use information in Table 4 to create your own key map. The backslash character (\) followed by a numeral indicates the octal value of the byte to be generated. For example, \033 is the octal code for character 27 (decimal), or the **ESCAPE** key.

Table 4. Key map key sequences

Key	Normal	Shift + key	Ctrl + key	Alt + key
Up Arrow	\033[A	\033[3\033[A	\033[2\033[A	\033[1\033[A
Down Arrow	\033[B	\033[3\033[B	\033[2\033[B	\033[1\033[B
Right Arrow	\033[C	\033[3\033[C	\033[2\033[C	\033[1\033[C
Left Arrow	\033[D	\033[3\033[D	\033[2\033[D	\033[1\033[D
Insert	\033[L	\033[3\033[L	\033[2\033[L	\033[1\033[L
Delete	\177	\033[3\177	\033[2\177	\033[1\177
Home	\033[H	\033[3\033[H	\033[2\033[H	\033[1\033[H
End	\033[F	\033[3\033[F	\033[2\033[F	\033[1\033[F
Page Up	\033[I	\033[3\033[I	\033[2\033[I	\033[1\033[I
Page Down	\033[G	\033[3\033[G	\033[2\033[G	\033[1\033[G
F1	\033[M	\033[Y	\033[k	\033[w
F2	\033[N	\033[Z	\033[l	\033[x
F3	\033[O	\033[a	\033[m	\033[y
F4	\033[P	\033[b	\033[n	\033[z
F5	\033[Q	\033[c	\033[o	\033[@
F6	\033[R	\033[d	\033[p	\033[[
F7	\033[S	\033[e	\033[q	\033[\ (backslash)
F8	\033[T	\033[f	\033[r	\033[]
F9	\033[U	\033[g	\033[s	\033[^ (caret)
F10	\033[V	\033[h	\033[t	\033[_ (underbar)
F11	\033[W	\033[i	\033[u	\033[` (backtick)
F12	\033[X	\033[j	\033[v	\033[' (quote)
Enter	\015	\033[3\015	\012	\033[1\015
Backspace	\010	\033[3\010	\177	\033[1\010
Ctrl-Alt-Del	\033[2\033[\177	Not applicable	Not applicable	Not applicable
Refresh Display	\033[~	Not applicable	Not applicable	Not applicable

Known issues

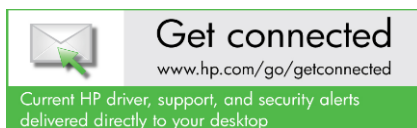
Issue	Details
Issue 1	Slow serial console response during BIOS redirection.
Description	The BIOS redirection sends ANSI control codes with text, which may slow the speed of the serial console during BIOS redirection process.
Solution	HP engineers are working to resolve this issue.
Issue 2	Scrolling and text may appear irregular during BIOS redirection.
Description	During BIOS redirection, the scrolling may not work properly. When you enter commands in RBSU, the text may rapidly overwrite itself on the bottom line of the terminal window.
Workaround	The BIOS expects and controls a fixed 80x24 character window. When redirected to the serial port, the BIOS still expects and controls a fixed 80x24 character window. If the VSP client being used (SSH, HyperTerminal, or other terminal emulator) can resize the window to a size other than 80x24, scrolling becomes confused and the screen output appears garbled. To avoid this issue, configure the terminal emulator for a window size of exactly 80x24.
Solution	HP engineers are working to resolve this issue.
Issue 3	VSP-driven selection during the serial timeout window sends output to BIOS redirect instead of the VSP.
Description	<p>The <code>/etc/grub.conf</code> file includes an option for a serial timeout window (<code>terminal - -timeout=10 serial console</code>). This setting provides a window of time to select a key stroke on the VSP or on the VGA console, and then the menu is output to the corresponding device.</p> <p>The BIOS serial redirect intercepts VSP keystrokes during this timeout window.</p>
Workaround	To work around this issue, do not press a key for a VSP-driven selection during the 10-second timeout or turn off BIOS redirection to the VSP.
Solution	HP engineers are working to resolve this issue.
Issue 4	Kudzu may display a message during the boot process to reconfigure ttyS1 (or the VSP).
Description	Kudzu may display a message during the boot process to reconfigure ttyS1 (or the VSP).
Solution	HP engineers are working to resolve this issue.

For more information

Resource description	Web address
Integrated Lights-Out Web site	www.hp.com/servers/lights-out
"Integrated Lights-Out security technology brief"	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00212796/c00212796.pdf
Enabling the Windows EMS Console, as described on the Microsoft Web site	http://download.microsoft.com/download/1/6/1/161ba512-40e2-4cc9-843a-923143f3456c/EMS.doc
RIBCL sample scripts package	http://h20000.www2.hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?lang=en&cc=us&prodTypeId=18964&prodSeriesId=1146658&prodNameId=1135772&swEnvOID=2025&swLang=8&mode=2&taskId=135&swItem=MTX-3b426a21bf8d40df88f91ea960
"HP Integrated Lights-Out Management Processor Scripting and Command Line Resource Guide"	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00294268/c00294268.pdf
DMTF CLP specification	http://www.dmtf.org/standards/smash

Call to action

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